

**TERTIARY AND VOCATIONAL EDUCATION COMMISSION**



**NVQ LEVEL 05 –SEMESTER I  
CONSTRUCTION TECHNOLOGY**



**HYDRAULICS**

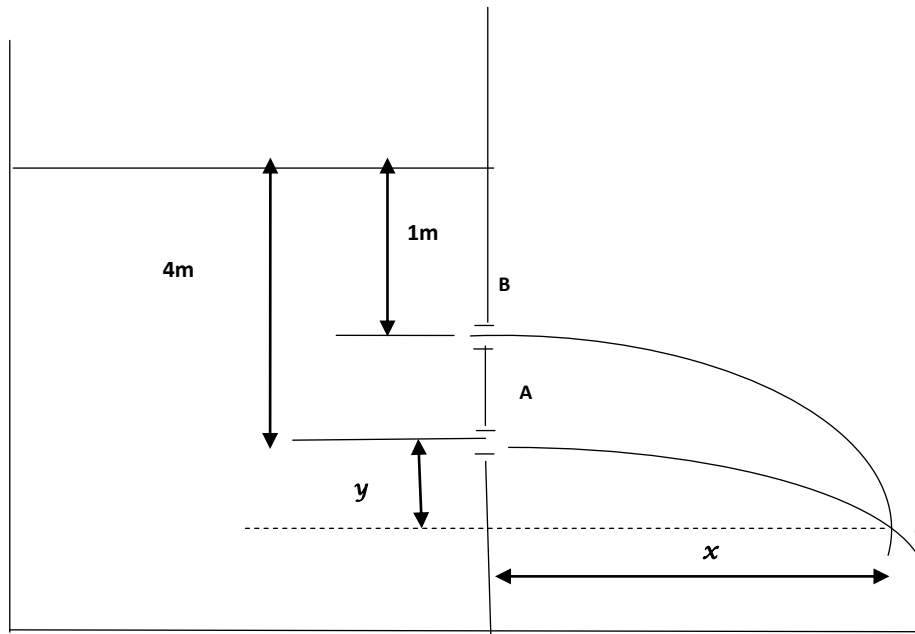
**F45C001M04**

**THREE HOURS**

**Answer any five (05) questions.**

**Question No. 01**

- i). Water flows through two (02) orifices on the same side of a vertical wall. Sizes of orifices are the same. Both jets meet at C, at a distance of  $x$  from the vertical wall. The depths of orifices A and B are 4 m and 1 m respectively from the top water level of the tank. If the coefficient of velocity ( $C_v$ ) is 0.90 calculate the distance  $x$  and depth  $y$ .



(14 marks)

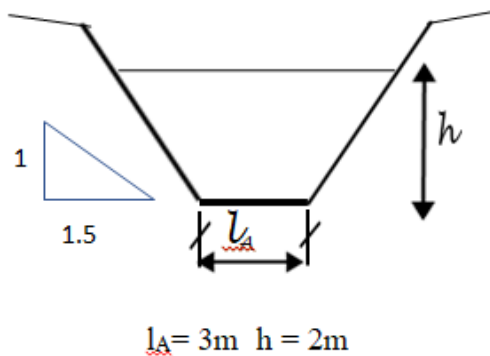
- ii). Express the Manning's Formula and describes each component of it and their roles in fluid flows. (06 marks)

**Question No. 02**

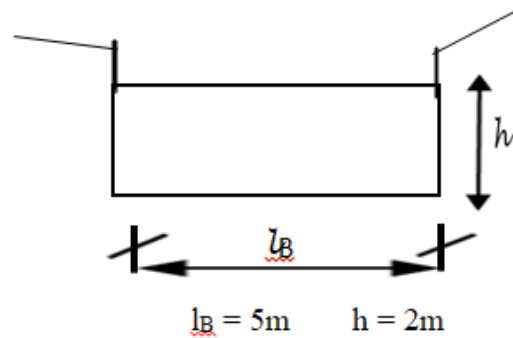
- i). Bernoulli principle is widely used in construction, varying from basic hydraulic structures to building complicated large structures. Explain this principle giving examples for three (03) types or places of application in construction industry. (06 marks)
- ii). A pipe line conveys oil from the point A to a point B. At the point A, the diameter of the pipe is 250mm, the center of the pipe is 8m above the datum line and the oil pressure is 45kpa. Similarly, at the point B, the diameter of the pipe is 300mm, the center of the pipe is 10m above the datum line and the pressure is 20kpa. If the velocity at A is 1.2 m/sec and the density of oil is  $912\text{kg/m}^3$  answer the following:
  - a) Calculate the energy at A; (04 marks)
  - b) If the discharge is steady and remains the same, find the velocity at B; (04 marks)
  - c) Calculate the energy at B; (04 marks)
  - d) Find the head loss from point A to B; (02 marks)

**Question No. 03**

- i). Two (02) types, namely trapezoidal and rectangular sections have been proposed for an open canal. The depth of water (h) remains as 2m and the bed slope is 0.0013. The roughness coefficient is 0.12. Refer the figures A and B below.



**Fig.A**



**Fig.B**

Assuming a uniform flow in both canals, calculate;

- a) The mean velocity and the discharge of flow in each; (11 marks)
- b) Which section can produce a larger flow? (01 mark)
- ii). What are the advantages and disadvantages of the above two sections for a canal? (04 marks)
- iii). Explain the factors affecting a smooth flow in an open canal. (04 marks)

**Question No. 04**

- i). Define “Notch” in fluids. Give examples for three (03) types of notches. (05 marks)
- ii). A rectangular notch is 0.8m wide having a constant head of 40cm. If the coefficient discharge is 0.60, find the discharge over the notch. (07 marks)
- iii). If the above notch is replaced with a V-notch having the same depth as 0.8m and the same discharge, what will be the angle of the notch? (08 marks)

**Question No. 05**

- i). Liquids are available in different forms and their properties are considered in designing fluid flows and structures. Explain five (05) properties of liquids. (10 marks)
- ii). Hydrostatic pressure acts on a vertical wall. The depth of water is “h” and the width of the wall is “b”.
  - a) Find the resultant force on the wall; (03 marks)
  - b) Find the depth of the centre of pressure; (04 marks)
  - c) How do you explain “Hydrostatic Force”? (03 marks)

**Question No. 06**

Select **four (04)** of the followings and write short notes; (05 x 4 = 20 marks)

- i). Forced vortex motion
- ii). Vena contracta
- iii). Absolute pressure
- iv). Surface tension
- v). Uniform flow